UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/997,693	11/30/2001	William P. Acker	21535-001	4703

35437 7590 09/15/2005

MINTZ LEVIN COHN FERRIS GLOVSKY & POPEO
666 THIRD AVENUE
NEW YORK, NY 10017

EXAMINER	
CANTELMO, GREGG	

ART UNIT	PAPER NUMBER
1745	

DATE MAILED: 09/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/997,693	ACKER ET AL.	
	Examiner	Art Unit	
	Gregg Cantelmo	1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 July 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,6-8,10-13,15-23 and 25-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,6-8,10-13,15-21,23 and 25-38* is/are rejected.

7)☒ Claim(s) *22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/6/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after allowance or after an Office action under *Ex Parte Quayle*, 25 USPQ 74, 453 O.G. 213 (Comm'r Pat. 1935). Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on July 6. 2005 has been entered.

Information Disclosure Statement

2. The information disclosure statement filed July 6, 2005 has been placed in the application file and the information referred to therein has been considered as to the merits.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 27 and 28 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 27 and 28 recites the limitation "said porous carbon" in lines 1-2 of each claim. There is insufficient antecedent basis for this limitation in the claim. Claim 25 does not provide proper antecedent basis for a porous

carbon material. However claim 26 does. Applicant is advised to amend the dependency of claims 27 and 28 to be dependent upon claim 26.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1, 2, 6-8, 15-21, 23, 25, 26 and 30-33 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,865,925 (Ludwig).

Ludwig discloses of a fuel cell comprising an MEA in Fig. 3 comprising a first material 82 for conducting protons and a second material 84, organized and arranged in one or more homogenous fields in predetermined locations in the first material which is gas permeable (see col. 9, ll. 33-55 as applied to claims 1 and 33). The microporous nature of the second material is held to be sufficiently capable of conducting CO2 gas, absent clear evidence to the contrary.

The first and second materials comprise respective fields in the electrolyte membrane (Fig. 3 as applied to claim 2).

The first material 82 includes a plurality of openings wherein the second material 84 is provided (Fig. 3 as applied to claim 6).

The first material is Nafion (col. 9, ll. 45-47 as applied to claims 7 and 8).

The gas permeable portions can be porous polypropylene, expanded PTFE, etc. (col. 5, ll. 13-37 as applied to claim 15).

The membrane is coated with catalytic material 74 and 76 (Fig. 3 and col. 9, ll. 33-55 as applied to claims 16 and 17).

The first and second materials 82 and 84 are combined to form a single layer structure 72 (Fig. 3 as applied to claim 18).

The second material 84 is divided into a plurality of portions which are spaced apart along the first material (Fig. 3 as applied to claim 19).

The electrolyte is a three-dimensional product and while Fig. 3 is a cross-section of the MEA, one of ordinary skill in the art would have recognized that the electrolyte array in Fig. 3 would have extended across the entire length of the membrane and thus the plurality of portions would extend in both the width and length of the MEA (as applied to claims 20 and 21).

Any given portion of the first material 82 is separated from a non-adjacent second material 84 (Fig. 3 as applied to claim 23).

Ludwig discloses of a fuel cell comprising an electrolyte material 82 for conducting protons and a second material 84, organized and arranged in one or more homogenous fields in predetermined locations in the first material which is gas permeable (see col. 9, ll. 33-5. The microporous nature of the second material is held to be sufficiently capable of conducting CO2 gas, absent clear evidence to the contrary. Anode layer 74 and cathode layer 76 are disposed proximate opposing sides of the electrolyte (Fig. 3) and each electrode comprises a catalyst layer formed on a gas diffusion layer (col. 9, ll. 10-18) and each electrode is housed in respective

compartments 20 (anode) and 18 (cathode) as shown in Fig. 1 (as applied to claims 25 and 34).

The gas diffusion layer (GDE) comprises porous carbon (col. 9, ll. 3-18 as applied to claim 26).

The GDEs are treated with Teflon, i.e., PTFE (col. 3, ll. 3-6 as applied to claims 30 and 31).

The porous GDEs have channels therein for gas transport (as applied to claim 32).

Response to Arguments

5. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ludwig in view of either U.S. Patent No. 6,465,136 (Fenton) or JP 06-103983 (JP '983).

The teachings of claim 1 have been discussed above and are incorporated herein.

The difference between claim 10 and Ludwig is that Ludwig does not teach of the first material comprising perfluorinated ionomer zirconium hydrogen phosphate.

The ion exchange material of Ludwig is Nafion, as discussed above. Nafion is only one of a plurality of ion exchange materials used in the fuel cell art.

Other materials include perfluorinated ionomer zirconium hydrogen phosphate as taught by Fenton (col. 2, ll. 22-47) and JP '983 (abstract).

The motivation for using such materials is that they exhibit higher ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Ludwig by selecting the ion exchange material to be perfluorinated ionomer zirconium hydrogen phosphate since it would have improved the ionic conductivity of the electrolyte. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

7. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ludwig in view of either U.S. Patent Nos. 5,656,389 (Tetzlaff), 6,355,149 (Soczka-Guth) or WO '480, of record.

The teachings of claim 1 have been discussed above and are incorporated herein.

The difference between claim 11 and Ludwig is that Ludwig does not teach of the first material comprising polyetheretherketone (PEEK).

Fuel cell electrolyte materials include PEEK as taught by Tetzlaff (col. 2, ll. 17-21) and Soczka-Guth (abstract) and WO '480 (page 17, ll. 1-12).

The motivation for using such materials is that it provides an electrolyte material having long-term stability.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Ludwig by selecting the ion exchange material to be PEEK since it would have improved the long-term stability of the electrolyte. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

8. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ludwig in view of either U.S. Patent No. 6,492,044 (Walsh) or Savinell, of record.

The teachings of claim 1 have been discussed above and are incorporated herein.

The difference between claim 12 and Ludwig is that Ludwig does not teach of the first material comprising polybenzimidazole (PBI).

Fuel cell electrolyte materias include other materials such as PBI as taught by Walsh (col. 3. ll. 13-22) and Savinell (see item 13 of the office action dated September 20, 2004, incorporated herein).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Ludwig by selecting PBI as a

component of the electrolyte membrane since PBI is a known membrane matrix material. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

9. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ludwig in view of either Fenton or JP '630, of record.

The teachings of claim 1 have been discussed above and are incorporated herein.

The difference between claim 13 and Ludwig is that Ludwig does not teach of the first material comprising PVDF.

Fuel cell electrolyte materials include other material such as PVDF as taught by Fenton (col. 4. ll. 42-54) and JP '630 (see item 14 of the office action dated September 20, 2004, incorporated herein).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Ludwig by selecting PVDF as a component of the electrolyte membrane since PVDF is a know membrane matrix material. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

10. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ludwig in view of Epp, of record.

The teachings of claims 25 and 26 have been discussed above and are incorporated herein.

The difference between claim 27 and Ludwig is that Ludwig does not teach of the porous carbon gas diffusion layers (GDEs) being carbon fiber paper.

Carbon fiber paper electrodes are conventional gas diffusion layers which are well-known in the fuel cell art. See Epp (col. 8, ll. 20-22).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Ludwig by selecting the porous carbon GDE to be carbon fiber paper since it would have provided a GDE having sufficient conductivity, gas permeability and mechanical backing for the catalyst layer. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

11. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ludwig in view of Fletcher, of record.

The teachings of claims 25 and 26 have been discussed above and are incorporated herein.

The difference between claim 28 and Ludwig is that Ludwig does not teach of the porous carbon gas diffusion layers (GDEs) being carbon cloth.

Carbon cloth electrodes are conventional gas diffusion layers which are well-known in the fuel cell art. See Fletcher (col. 11, ll. 15-29).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Ludwig by selecting the porous carbon GDE to be carbon cloth since it would have provided a GDE having sufficient conductivity, gas permeability and mechanical backing for the catalyst layer. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

12. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ludwig in view of Lindstrom, of record.

The teachings of claim 25 have been discussed above and are incorporated herein.

The difference between claim 29 and Ludwig is that Ludwig does not teach of the gas diffusion layer including a thickness between approximately 150-400 microns.

Lindstrom teaches that carbon gas diffusion electrodes having preferred thicknesses between 10 and 35 mils (254-889 microns) has long since been established in the art (col. 3, 11. 55-60).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Ludwig by selecting the gas diffusion layers) to include a thickness between approximately 150-400 microns since

such thick nesses are shown to provide gas diffusion members having optimal electromechanical properties. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969).

13. Claims 25-27 and 32-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. patent No. 5,945,231 (Narayanan) in view of Ludwig.

Narayanan discloses a fuel cell comprising a housing 102 forming an anode chamber 122 and a cathode chamber 132, proton conducting membrane electrolyte 1 10, catalyst layers proximate the electrolyte (Figs. 1-3B), and gas diffusion layers (col. 3, 11. 30-50 as applied to claims 25 and 33-35 and 38). The fuel cell comprises a housing as further defined in claim 33. The fuel cell comprises a housing and electrode chambers as further defined in claims 34 and 35.

The fuel cell comprises a fuel delivery device and fuel source having a carbonaceous fuel in fluid communication with the fuel delivery device, gas inlets and outlets to both the anode chamber and cathode chamber (Fig. 1) as further defined in claim 35.

The fuel cell comprises a fuel delivery device, fuel source in fluid communication with the fuel delivery device, anode chamber having a gas inlet for receiving the fuel mixture, cathode having an inlet and outlet (Fig. 1) as further defined in claim 38.

The backing layer can be a carbon fiber sheet (col. 3, 11. 43-44 as applied to claims 26 and 27).

The carbon paper has inherent channels which permit the flow of gas to and from the electrolyte membrane, thereby generating electric current (as applied to claim 32).

With respect to claims 36-37: The fuel source is a part of the fuel cell system and is internal to the fuel cell system (Fig. 1 as applied to claim 36).

The fuel cell source is extefnal to the fuel cell stack component of the system (Fig. 1 as applied to claims 37).

The difference between instant claims 25 and 33-35 and Narayanan is that Narayanan does not teach of the electrolyte layer having first and second materials as recited therein.

Ludwig teaches of electrolyte materials having a first material which is proton conducting and a second material which is gas evolving (as discussed in the anticipatory rejections in the previous office action, incorporated herein).

The motivation for using the electrolyte membranes of Ludwig is that it provides an gas permeable membrane having excellent ionic conductivity.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Narayanan by using the electrolyte membrane of Fenton since it would have provided an gas permeable composite membrane having excellent ionic conductivity.

14. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Narayanan in view of Ludwig as applied to claims 25-27, 32, and 34-38 above, and further in view of U.S. patent No. 5,798,186 (Fletcher).

The teachings of claims 25 and 26 have been discussed above, incorporated herein.

The difference not yet discussed is of the porous carbon being a carbon cloth.

Fletcher teaches that both carbon fiber paper and carbon cloth are known equivalent gas diffusive layers for use in MEAs (col. 1, ll. 15 -29).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Narayanan by using carbon cloth or carbon fiber paper as the gas diffusive layer since both materials are shown by Fletcher to be equivalent materials for use as such. The selection of a known material based on its suitability for its intended use supported a prima facie obviousness determination in Sinclair & Carroll Co. v. Interchemical Corp., 325 U.S. 327, 65 USPQ 297 (1945) See also In re Leshin, 227 F.2d 197, 125 USPQ 416 (CCPA 1960). MPEP § 2144.07.

1. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Narayanan in view of Fenton as applied to claims 25-27, 32, and 34-38 above, and further in view of U.S. patent No. 4,248,682 (Lindstrom).

The teachings of claim 25 have been discussed above, incorporated herein.

The difference not yet discussed is of the gas diffusion layer including a thickness between approximately 150-400 microns.

Lindstrom teaches that carbon gas diffusion electrodes having preferred thick nesses between 10 and 35 mils (254-889 microns) has long since been established in the art (col. 3, ll. 55-60).

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Narayanan by selecting the gas diffusion layer(s) to include a thickness between approximately 150-400 microns since such thick nesses are shown to provide gas diffusion members having optimal electromechanical properties. Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesche , 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985).

2. Claims 30 and 31 rejected under 35 U.S.C. 103(a) as being unpatentable over Narayanan in view of Ludwig as applied to claims 25-27, 32, and 34-38 above, and further in view of Epp.

The teachings of claim 25 have been discussed above, incorporated herein.

The differences not yet discussed are of providing a Teflon additive to the gas diffusion layer.

The fiber papers 44 and 50 are treated with a Teflon additive (Epp, col. 8, ll. 20-35 as applied to claims 29 and 30).

The motivation for coating the carbon gas diffusion electrode with Teflon is to improve the water repellency of the electrode.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of Narayanan by adding Teflon to the carbon electrodes since it would have improve the water repellency of the electrode.

Allowable Subject Matter

15. Claim 22 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Ludwig discloses of a fuel cell comprising an MEA in Fig. 3 comprising a first material 82 for conducting protons and a second material 84, organized and arranged in one or more homogenous fields in predetermined locations in the first material which is gas permeable (see col. 9, ll. 33-55 as applied to claims 1 and 33). The microporous nature of the second material is held to be sufficiently capable of conducting CO2 gas, absent clear evidence to the contrary.

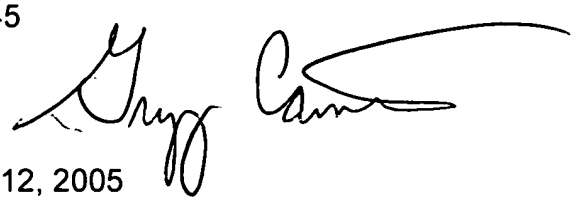
Ludwig does not appear to teach, fairly suggest or render obvious the invention of claim 22. In particular: of the membrane electrolyte according to claim 1, wherein said second material comprises a web of micromesh and the first material comprises a plurality of strips positioned intermittently along the second material.

None of the remaining prior art of record teach, fairly suggest or render obvious the configuration defined in claim 22. Therefore claim 22 appears allowable over the prior art of record.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (571) 272-1283. The examiner can normally be reached on Monday to Thursday from 9 a.m. to 6 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. FAXES received after 4 p.m. will not be processed until the following business day. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Gregg Cantelmo
Primary Examiner
Art Unit 1745
gc



September 12, 2005